JOURNAL OF ECONOMIC DEVELOPMENT 21
Volume 43, Number 4, December 2018

DEREGULATION, ECONOMIC GROWTH AND GROWTH ACCELERATION

PETAR STANKOV*

Royal Holloway, University of London, UK
and University of National and World Economy, Bulgaria

The paper analyzes the influence of credit-, labor-, and product market deregulation policies on economic growth in more than 70 economies over a period of 40 years. By combining a difference-in-difference strategy with an IV approach to the endogeneity of the reform timing, this work finds that deregulation contributed to the per capita GDP levels of the early and consistent reformers relatively more than to the ones of the late reformers. The paper also finds a significant growth acceleration effect from market-oriented reforms over shorter periods of time. However, the growth acceleration effects dissipate over longer periods. A number of robustness checks support these conclusions.

Keywords: Economic Growth; Political Economy of Reforms; Energy Independence
JEL Classification: O11, O47, O57, P48

1. INTRODUCTION

The 1970s productivity decline triggered a wide range of policy responses, including economic deregulation—the state's withdrawal of its legal powers to direct pricing, entry and exit (Winston, 1993). Deregulation reforms were initiated in the US (Morgan, 2004; Winston, 1998), followed by the UK and other developed economies in the early 1980s (Matthews et al., 1987; Pera, 1989) and were imitated by the new democracies and many developing countries in the 1990s. The process continued in the 21st century (Wölfl et al., 2009) until the global economic and financial crisis stalled the momentum

* I thank Lubomír Lízal, Libor Dušek, Peter Katuščák, Evangelia Vourvachaki, Jan Švejnar, Jan Kmenta, Levent Çelik, Byeongju Jeong, Peter Ondko, Ilkin Aliyev, Robin-Eliece Mercury, David Tarr, Diana Weinhold, Oleksandr Shepotylo, Volodymyr Vakhitov and an anonymous referee at this journal for their excellent suggestions. I also thank Tomasz Mickiewicz and the seminar participants at the University College London for helpful ideas. This project was partially financed by the Grant Agency of the Czech Republic from its P402/11/P785 grant, and an individual grant R10-1511 from the Economics Education and Research Consortium, Inc. (EERC). All errors remain the sole responsibility of the author.

for deregulation reforms (Stankov, 2017).

The differences in the deregulation reform timing across countries point to a natural question: Did the early reformers—those countries reforming extensively in the 1970s and the 1980s—benefit more than the late reformers in improving their living standards and in accelerating economic growth? If they did, then the economies that innovated with deregulation enjoyed growth, while those who imitated those reforms did not always benefit from deregulation, as Rodrik (2008) suggests.

Answering this question is important at least for two reasons. On the one hand, most of the literature uses the time variation of various reform indices. However, using those directly in estimations is problematic because equal changes in the indices represent unequal policy changes. This work proposes a way out from this problem by using a difference-in-difference estimation which gets around the direct use of reform indices.

On the other hand, few papers account for where the time variation in the indices comes from, and if they do, their instruments are rarely time-varying. This work uses two time varying indicators for each country which are arguably both strong and valid in predicting the timing of the deregulation reform. Those are a country's energy independence and its natural resource rents. I find that the more energy independent the country is, and the more natural resources it has, the later it deregulates its product-, labor- and credit markets.

By combining how the reform timing affects living standards and growth with the reasons countries reform at different times, the paper addresses simultaneously two of the long-standing problems in the empirical analysis of deregulation reforms. At the same time, the work supports the previous evidence of a positive impact of deregulation on growth. The results also demonstrate important differences in the reform outcomes across countries. The benefits from deregulation were unequally spread, and the timing of the reform played an important role in reaping those benefits. Specifically, while early reformers enjoyed higher living standards, it is the late reformers' growth that accelerated most, especially after a credit market deregulation reform. Then, despite the evidence that most reforms do not produce growth accelerations (Hausmann et al., 2005), credit market reforms seem to be an exception.

2. LITERATURE

The traditional view on economic deregulation is that it increases economic growth by spurring productivity and efficiency gains (Winston, 1993), employment and real wages (Blanchard and Giavazzi, 2003), and investment (Alesina et al., 2005). However, a newer line of literature contends that deregulation reforms influence different economies differently, depending on their position on the technology ladder and on their quality of institutions. For example, Acemoglu et al. (2006) claim that certain restrictions on competition may benefit the technologically backward countries, while Estache and Wren-Lewis (2009) find that the optimal regulatory policies in developed

and in developing countries are different because of differences in the overall institutional quality in those countries. In addition, Aghion et al. (2007) find that industries closer to the technology frontier would innovate more than the backward industries after deregulation. This result implies that countries closer to the technology frontier would benefit more from deregulation.

The varying effects of deregulation are evident in the literature on specific reforms, such as labor- and capital-market deregulation. For example, MacLeod and Nakavachara (2007) test that more stringent labor regulations reduce employee turnover and lead to a more productive employee-employer relationship for some types of occupation, especially the high-skilled ones. Acharya, Baghai, and Subramanian (2013) find support for the hypothesis that stricter labor dismissal laws encourage innovation within firms, and therefore, could potentially promote labor productivity and economic growth. The intuition is that labor laws provide the high-skilled innovative staff with a certain degree of insurance in case of a short-term failure to innovate.

These results contradict the traditional argument that labor regulations impose costs to firms and thus reduce labor force participation (Botero et al., 2004), investment as well as value added per worker (Cingano et al., 2010). Autor et al. (2007) present evidence that imposing employment protection laws increases employment but reduces productivity in the US. Further, Bassanini et al. (2009) extend the latter evidence for a sample of OECD countries. Deakin and Sarkar (2008) and Freeman (2010) assert that the effects from labor laws on growth would ultimately depend on context-specific factors, and therefore, are always tentative.

The same can be said for the reform impact of credit market regulation (CMR). On the one hand, Jayaratne and Strahan (1996) find that both output and per capita income rise after banking deregulation, and Demirgüç-Kunt and Levine (2008) and Demirgüç-Kunt et al. (2004, p.593), among many others, present the intuition why credit market deregulation may lead to growth: “tighter regulations on bank entry and bank activities boost the cost of financial intermediation”.

The global financial crisis of 2007-2008 produced a flurry of alternative views on the impact financial deregulation. For example, Calomiris (2009, p.62) concludes that banking regulations have “...always been the key additional necessary condition to producing a propensity for banking distress” and Levine (2010, p.3) maintains that “...financial regulations and policies created incentives for excessive risk.” Still, Tarr (2010) argues that deregulation is unrelated to the financial crisis of 2007-2009.

This work extends the literature in the nexus of deregulation and growth in two ways. First, it approaches the measurement of various deregulation reforms in a similar fashion to Estevadeordal and Taylor (2013) who transform the traditionally used reform indices into dummy variables, thereby allowing for a difference-in-difference estimation. The advantage of this approach lies in using the reform indices to construct policy treatment and control groups rather than using the indices directly to infer the effect of a unit change of a reform index.

Second, few empirical papers account for where the time variation in the indices

comes from. For example, Alesina et al. (2005) use lagged values of product market regulation indices as instruments for current regulation for OECD countries only. Barseghyan (2008) uses a number of instruments for entry regulations and property rights, such as geographical latitude, legal origins, settler mortality, and indigenous population density as early as the 16th century for a large sample of countries. However, as Barseghyan's instruments do not vary over time, they can explain only the cross-sectional variation in the reform data. As a result, the studies using those instruments fail to explain the time variation in deregulation reforms.

In contrast, I explore energy independence and natural resource rents across countries which also vary over time to predict the timing of the deregulation reforms, and only then study the impact of those reforms on growth. Beck and Laeven (2006) apply similar logic to a broad aggregate index of institutional reforms in 24 transition economies. Both the energy independence and rents indicators, as well as the empirical strategy, are detailed below.

3. EMPIRICAL STRATEGY

3.1. Benchmark Model

Much in the spirit of Estevadeordal and Taylor (2013), I define reformers between 1970 and 1990 as countries with an above-median (above-mean) increase in the Economic Freedom of the World (EFW) index of regulation between 1970 and 1990 and non-reformers otherwise. Identically, reformers between 1990 and 2010 are defined as countries with an above-median (above-mean) increase in the EFW index of regulation between 1990 and 2010 and non-reformers otherwise. Thus, four distinct groups of countries emerge: 1) non-reformers in the first period becoming reformers in the second period (late reformers); 2) reformers in the first period becoming non-reformers in the second period (early reformers); 3) reformers in both periods ("marathon" or consistent reformers); and 4) non-reformers in both periods. The first three groups are the policy treatment groups in all baseline estimations, while non-reformers are the control group.

Although the data split may seem arbitrary, it is justified for several reasons. First, the data are such that they allow for two equally long periods to be constructed. Second, 1990 marks the start of many market-oriented reforms across a wide range of economies. As the data description demonstrates, the reforms before 1990 were rather sporadic, while after 1990 they were widespread but varying in their magnitude. Third, splitting the data into smaller periods would present a challenge in capturing a policy variation within a decade or within a shorter span, as many economies might not reform at all within shorter periods of time. Finally, the 1990 threshold is not new to the literature on the impact of deregulation on growth: Alesina et al. (2005) use it as well. Therefore, we consider splitting the data into two relatively long 20-year periods suitable for this empirical work.

To address how the timing of the reform affected living standards and growth, I estimate the following benchmark model:

$$\Delta y_{it} = \beta_1 + \beta_2 ER_{it} + \beta_3 LR_{it} + \beta_4 MR_{it} + X_{it}\beta_5 + \Delta\varepsilon_{it}, \quad (1)$$

where Δy_{it} is either the difference in the average log-GDP per capita for country i in period t, $\Delta Avg.log(GDP)_{it}$, to measure the effect of the reform on the living standards, or the difference in the compound growth rates between the two periods, denoted by Δg_{it}, to measure the growth acceleration effect; ER_{it} is a dummy variable equal to 1 if the country was an early reformer and 0 otherwise; LR_{it} is a dummy variable equal to 1 for the late reformers and 0 otherwise; MR_{it} are the countries that were reformers in both periods; X_{it} is a matrix of country characteristics, such as: i) the initial level of log-GDP in 1970 to control for growth convergence and initial conditions, and ii) other institutional reform covariates such as barriers to trade; and $\Delta\varepsilon_{it}$ is an error term.

3.2. 2SLS Estimation

The above benchmark estimation does not account for the origin of reforms. To do that, the following local average treatment effect (LATE) model is estimated as a first-stage of a 2SLS procedure, suggested in Cameron and Trivedi (2005):

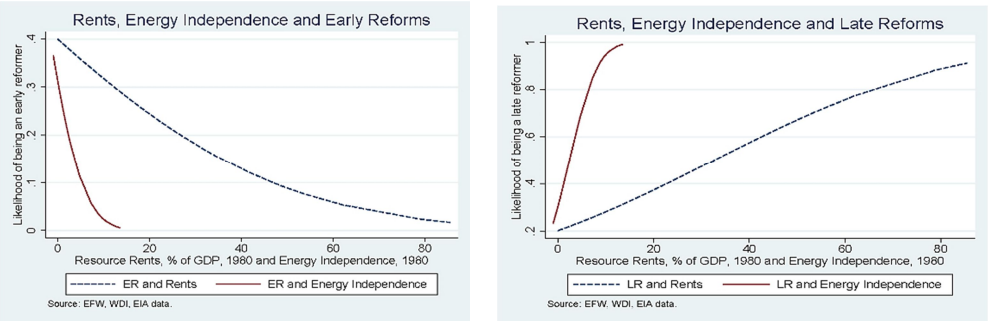
$$\Delta y_{it} = X_{it}\beta + \alpha D_{it} + \Delta\nu_{it}, \quad (2)$$

where X_{it} is the matrix of the observed explanatory variables described above, and D_{it} is a policy treatment indicator variable that depends on an instrumental variable, z_{it}. Effectively, this means the policy participation is driven by some unobservable factors $(D^*)_{it}$ that in turn depend on some predetermined country characteristics, z_{it}, which I assume exogenous. Those characteristics are the instrumental variables which vary over time and can arguably predict the selection into early, late, and marathon reformers. The instrument is the energy independence of a country i in period t, and the natural resource rents of the same country in the same period. In line with the political economy literature, the more energy abundant the country is and the more natural resources it possesses, the less incentives its policy makers have to deregulate at any point in time. Therefore, the more energy independent the country is, and the more rents it has from natural resources, the probability of reforming early declines. At the same time, however, changes in the resource abundance may also influence political decisions to reform or to revert reforms at any point in time. Therefore, the energy independence instrument is constructed as follows:

$$z_{it} = (P_{it} - C_{it})/C_{it}, \; z_{it} \in [-1, +\infty), \quad (3)$$

where P_{it} is the production, and C_{it} is the consumption of energy in a given year between 1980 and 2009. The variable zit also means that the more production of energy there is in the country, the more energy-independent the country becomes. For example, if $z_{it} = 9$, then the country produces 10 times more energy than it consumes.

Apart from the energy independence, the time variation in reforms may also come from the natural resource abundance a country enjoys. The resource abundance is measured with the natural resource rents as a share of GDP.



(a) (b)

Figure 1. Rents, Energy Independence and the Likelihood of Early and Late Reforms

The relationship between the natural resource rents, the energy independence and the likelihood of market-oriented reforms is presented in Figure 1. In line with our political economy expectations, panel 1(a) indicates that the more energy-independent the country is, i.e. the higher the share of its consumption which could be satisfied from local production, the lower the probability is of the country being an early reformer. In addition, panel 1(b) demonstrates that energy-rich countries actually have a higher probability of reforming late. Identical conclusions are reached when the share of natural resource rents in GDP is used to predict the likelihood of an early or late reforms.

The natural resource underpinning of market-oriented reforms is supported by other empirical findings. For example, Levine (2005) argues that endowments create elites who subsequently shape the property rights of a country in their own favor of in favor of a strong private sector. Further, Beck and Laeven (2006) isolate the exogenous component of the institutional variation by using the natural resource argument for transition economies. In addition, Mulligan and Tsui (2015) develop a theory justifying why resource abundant countries tend to be non-democratic, and Tsui (2011) finds empirical support for it. These findings support the validity of using the path of resource independence over time as a predictor of the timing of market-oriented reforms.

There is one major concern when using the time variation in rents and energy independence as instruments for the timing of reforms: its correlation with living

standards and growth. It is certainly true that energy production and consumption is correlated with both GDP levels and growth within a period. Within a given short period, higher energy production and consumption and higher resource rents raise GDP and GDP growth. At the same time, higher rents and energy independence make politicians postpone reforms. This turns richer and faster growing countries—especially those who made their fortunes after discovering natural resources—into candidates for being late reformers. Therefore, if there is a positive correlation between resources and GDP, and between resources and reforming late or never, then there should be a positive correlation between being a non-reformer, a late reformer and GDP. Then, the estimates of being an early or a marathon reformer would actually be biased downwards in both OLS and the 2SLS estimations.

At the same time, the validity of the instrument is justified by the emerging evidence that rents and energy independence have only a short-term direct impact on economic growth, if it has any impact at all (Alexeev and Conrad, 2009), which justifies using this instrument over longer periods.

3.3. Data

3.3.1. Deregulation Reforms

The explanatory variables on the changes of the index of regulation and other reforms are taken from the Gwartney et al. (2012) index of Economic Freedom of the World (EFW) data, which traces the economic policy development in 144 countries back to 1970 in the following relevant policy areas: 1) Size of Government: Expenditures, Taxes, and Enterprises; 2) Legal Structure and Security of Property Rights; 3) Freedom to Trade Internationally; and 4) Regulation of Credit, Labor, and Business. Those indices are transformed into reform variables, as outlined in the empirical model description. The main explanatory variable is taken from the changes in the index of Regulation of Credit, Labor, and Business.

3.3.2. Country-level Economic Growth

One of the most comprehensive sources of country-level GDP and growth data is the 7.1 version of the Penn World Table (PWT) by Heston et al. (2012). My main dependent variables are the GDP per capita and the GDP per worker which are the RGDPCH and the RGDPWOK variables in the PWT. For every country in the sample, the dependent variables are constructed as follows: take the average log-level of GDP per capita for the first period (1971-1990) and difference it from the log-level of GDP per capita for the second period (1991-2010). Thus, we have a data point for every country, which indicates the difference in the average log-GDP between the two periods.

Further, the geometrically averaged compound growth rate is measured within each 20-year period and for each country. The difference of the two compound growth rates

suggests of a growth acceleration or deceleration after 1990. This difference is the second dependent variable used in this work. The match between non-missing GDP levels and growth rates and the overall EFW index of regulation over the 1970-2010 period is for 39 countries only, which is the size of the baseline sample. As there is more abundant data on credit market regulation (CMR) reforms, the match with the EFW index of CMR over the 1970-2010 period is for 65 countries. As this is admittedly a rather small sample, it is further extended in ways explained below in the robustness checks section.

As a supplementary dataset on growth performance and its factors, I use the World Development Indicators (WDI) database. It contains information on GDP, GDP per capita and GDP per worker from 214 countries and territories since 1960. Using the WDI for a robustness check is necessary, as there are some differences in the way the growth series are constructed. Thus, the choice of data might affect the estimation results (Hanousek et al. 2008). Using both the PWT and the WDI data sets allows for checking if the results hinge on the data source. The natural resources rents data set is also obtained from the WDI database. It spans across the entire 40-year period of reforms and growth for 131 countries.

Finally, the data on the energy production and consumption, which are needed to construct the energy independence indicator, are taken from the US Energy Information Administration (EIA). The database contains annual observations for 193 countries and territories between 1980 and 2009.

4. RESULTS

The results from OLS and 2SLS estimations of the benchmark equation (1) in which the reform dummies are predetermined by the country's own energy independence are presented in Table 1. The table is divided into two main sections, identifying the two main discrimination criteria between reformers and non-reformers: the median and the mean criterion. In the first four models, the median criterion is being used, while the mean criterion is applied in the latter four models. Within each criterion, four estimations are carried out, two for each level of aggregation of the reform variable. In the first two models, OLS and 2SLS estimations are presented with the underlying explanatory variable being the overall index of regulation for the given economy. In the second pair of models, the underlying explanatory variable is the sub-index of financial regulation only.

Table 1 demonstrates clearly that late reformers (LR), or those countries that lagged behind in their deregulation reform in the 1970s and in the 1980s but accelerated the reform in the 1990s and in the early years of the 21st century, had lower per capita GDP levels than the early reformers (ER) and those countries that reformed extensively in both periods—the "marathon" reformers (MR). Model (1) in Table 1 produces an expected result: ERs increased their per capita GDP about 40% points more than the

LRs, and the MRs increased their living standards by about 20% points. This means deregulating early and continuously is also associated with significantly higher living standards. The result is obtained when controlling for other institutional variables, such as removing trade barriers, and for initial per capita GDP levels.

Table 1. Deregulation and Average Levels of real GDP per capita: 1970-2010

	Median criterion				Mean criterion			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
ER	0.397***	0.426***			0.456***	0.496***		
	(0.135)	(0.140)			(0.133)	(0.142)		
LR	-0.002	-0.030			-0.047	0.006		
	(0.131)	(0.150)			(0.105)	(0.126)		
MR	0.188*	0.267**			0.178	0.215		
	(0.105)	(0.120)			(0.122)	(0.131)		
FTER	0.095	0.092	0.034	-0.122	-0.097	-0.164	0.010	-0.127
	(0.095)	(0.113)	(0.113)	(0.182)	(0.105)	(0.113)	(0.118)	(0.178)
FTLR	0.221	0.240	0.126	0.225	0.041	0.040	0.110	0.240
	(0.329)	(0.312)	(0.107)	(0.228)	(0.240)	(0.233)	(0.107)	(0.217)
FTMR	0.326	0.308	0.137	0.218	0.412	0.554*	0.178	0.278
	(0.345)	(0.303)	(0.146)	(0.252)	(0.290)	(0.292)	(0.161)	(0.250)
RGDPc'70	0.110	0.112	0.046	0.054	0.109	0.118	0.034	0.032
	(0.120)	(0.108)	(0.050)	(0.055)	(0.110)	(0.102)	(0.049)	(0.051)
CMER			0.144	0.351			0.125	0.272
			(0.117)	(0.220)			(0.110)	(0.231)
CMLR			-0.291**	-0.411*			-0.349**	-0.484**
			(0.142)	(0.217)			(0.147)	(0.227)
CMMR			-0.060	-0.099			-0.083	-0.200
			(0.141)	(0.203)			(0.158)	(0.228)
Const.	-0.895	-0.928	-0.125	-0.210	-0.720	-0.806	0.000	-0.012
	(1.118)	(1.062)	(0.473)	(0.600)	(1.038)	(0.957)	(0.474)	(0.557)
N	39	39	65	65	39	39	65	65
R^2	0.334	0.323	0.239	0.072	0.449	0.434	0.243	0.117
Hansen J		0.347		0.245		0.553		0.182
APF-ER		9.289		6.015		16.177		4.945
APF-LR		2.379		6.422		8.306		9.691
APF-MR		4.891		13.716		15.175		7.521

Notes: The estimated OLS equation is $\Delta Avg.log(GDP)_{it} = \beta_1 + \beta_2 ER_{it} + \beta_3 LR_{it} + \beta_4 MR_{it} + X_{it}\beta_5 + \Delta\varepsilon_{it}$, where $\Delta Avg.log(GDP)_{it}$ is the difference in the average log-levels of per capita GDP. The variables ER, LR and MR are the Early-, Late-, and Marathon reformers, respectively, as defined in the text. The variables CM-ER, CM-LR and CM-MR are the early-, late-, and marathon reformers in the credit market regulation as defined in the text. The variables FT-ER, FT-LR and FT-MR are the early-, late-, and marathon reformers in the freedom to trade internationally as defined in the text. RGDPc'70 is the log of real GDP per capita in 1970. Robust standard errors are presented in parentheses. Hansen J is the P-value on the Hansen overidentification test. APF- is the value of the Angrist-Pischke first stage F-test on the endogenous variables of interest. Data source: PWT 7.1 data; EFW 2012 index; US EIA data. Symbols: * p < 0.10, ** p < 0.05, *** p < 0.01.

In model (2), I control for the same variables. At the same time I estimate the model by 2SLS and instrument with energy independence in each year between 1980 and 2009. The results not only retain their sign but also increase both their magnitude and their significance. This confirms that early and marathon reformers become considerably richer while reforming their overall labor-, business- and financial regulations. The instruments pass the Hansen over-identification J-test, which is a good signal about their validity. The Angrist-Pischke first stage F-test (APF), however, points to a plausible weakness of the instruments.

The estimates above reveal the effect of an overall deregulation reform. Thus, the above results are somewhat loose and difficult to interpret. In models (3) and (4), I replace the overall reform variable with an identically constructed variable tracking down only one of the three reforms constituting the overall reform: the deregulation on the credit market. Although the results are not as strong as before in terms of magnitude, the sign remains indicative of the inherent difference between the three types of reformers: The levels of per capita GDP of the ERs and MRs were significantly higher than those of the LRs. The same result holds when the reform is instrumented with energy independence in the 2SLS model.

The results above do not change if a different criterion for defining the reformers and non-reformers is applied within each 20-year period. When I use the mean of reforms across all countries instead of the median to distinguish the timing of the reform, the early reformers still appear better-off than both the late reformers and the non-reformers. The significance is lost for the MRs though which might indicate that the results are sensitive to how the reformers are defined. Just as before, the APF tests point to a possible weakness of the instruments.

Using the compound GDP/c. growth as the explained variable brings additional information on the growth effect from the deregulation reforms since 1975. Table 2 presents the results obtained from the compound GDP/c. growth regressions. While in the previous estimations it was evident that the one-shot growth effect was different for the various types of reformers, the effect on growth acceleration is far less obvious. There is no significant difference between the various types of reformers in models (1) and (2), which indicates that an overall deregulation and liberalization of the labor-, product- and credit markets may not cause growth acceleration over a 20-year period. This is evident from the insignificant estimates on both the overall reform variables and the credit market reform variables (ER, LR, MR and CMER, CMRL, CMMR, respectively). However, there appears to be a large positive and significant acceleration effect from trade liberalization alone, which adds evidence to the gains from trade liberalization literature.

It would be naive to treat the above results as unbiased and consistent without questioning a few important features of the model and the data. First, the model uses too few observations. Although data limitations are a natural weakness of models which go as far back as the 1970s, the number of observations could be increased significantly. Second, the 2SLS estimations do not use the rents from natural resources and resort to

instrumenting reforms with the energy dependence alone.

Table 2. Deregulation and Compound Economic Growth: 1970-2010

	Median criterion				Mean criterion			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
ER	0.276	0.103			-0.321	-0.417		
	(0.871)	(0.761)			(0.659)	(0.651)		
LR	0.238	0.163			-0.208	-0.547		
	(0.775)	(0.646)			(0.517)	(0.563)		
MR	0.618	0.308			0.481	0.417		
	(0.827)	(0.750)			(0.660)	(0.572)		
FTER	-0.340	-0.259	-0.553	0.621	0.003	0.141	-0.094	1.473**
	(0.517)	(0.510)	(0.549)	(0.787)	(0.460)	(0.502)	(0.502)	(0.715)
FTLR	0.712	0.753	0.441	2.285**	0.920	1.055	0.622	2.018*
	(0.926)	(0.866)	(0.801)	(1.132)	(0.727)	(0.677)	(0.688)	(1.038)
FTMR	1.206	0.860	0.838	2.550**	0.704	-0.881	0.895	2.482**
	(1.053)	(0.987)	(0.757)	(1.215)	(0.863)	(1.906)	(0.764)	(1.241)
RGDPc'70	0.181	0.176	0.065	0.361	0.219	0.186	0.152	0.392
	(0.191)	(0.175)	(0.225)	(0.237)	(0.180)	(0.170)	(0.220)	(0.244)
CMER			-0.237	0.123			-0.376	-0.428
			(0.541)	(1.129)			(0.516)	(1.095)
CMLR			0.934	1.325			1.316	1.645
			(0.811)	(0.975)			(0.812)	(1.067)
CMMR			0.064	0.379			0.428	0.752
			(0.789)	(0.945)			(1.027)	(1.085)
Const.	-2.521	-2.365	-0.977	-4.844*	-2.656	-2.258	-1.961	-5.080*
	(2.235)	(2.061)	(2.228)	(2.807)	(2.015)	(1.882)	(2.176)	(2.769)
N	39	39	65	65	39	39	65	65
R^2	0.105	0.095	0.169	0.022	0.110	0.046	0.187	0.018
Hansen J		0.264		0.174		0.340		0.249
APF-ER		9.289		6.015		16.177		4.945
APF-LR		2.379		6.422		8.306		9.691
APF-MR		4.891		13.716		15.175		7.521

Notes: The estimated OLS equation is $\Delta g_{it} = \beta_1 + \beta_2 ER_{it} + \beta_3 LR_{it} + \beta_4 MR_{it} + X_{it}\beta_5 + \Delta\varepsilon_{it}$, where Δg_{it} is the difference in the compound growth rate between the two periods. The variables ER, LR and MR are the Early-, Late-, and Marathon reformers, respectively, as defined in the text. The variables CM-ER, CM-LR and CM-MR are the early-, late-, and marathon reformers in the credit market regulation as defined in the text. The variables FT-ER, FT-LR and FT-MR are the early-, late-, and marathon reformers in the freedom to trade internationally as defined in the text. RGDPc'70 is the log of real GDP per capita in 1970. Robust standard errors are presented in parentheses. Hansen J is the P-value on the Hansen over identification test. APF- is the value of the Angrist-Pischke first stage F-test on the endogenous variables of interest. Data source: PWT 7.1 data; EFW 2012 index; US EIA data. Symbols: * p < 0.10, ** p < 0.05, *** p < 0.01.

Third, the results above also ignore important time-invariant country characteristics which might affect both living standards and growth prospects of any of the countries in the sample. Also, 1990 draws a meaningful division line between early and late reformers due to the fact that the bulk of the reforms were done after 1990 for most of the countries. However, imposing 1990 on all countries at the same time kills a lot of cross-country heterogeneity in reform patterns. Therefore, an interesting remaining question is how does a country's own deregulation reform pattern—not the relative reform pattern to the other countries in the distribution of reformers—influence the growth outcomes. To address these issues, panel data methods could significantly help.

Fourth, the above results are produced with the PWT data on GDP and GDP growth. It would be interesting to see if the results hinge on the choice of dependent variables data source. Those weaknesses of the model are addressed in the next section.

5. ROBUSTNESS CHECKS

To address the weaknesses of the baseline model, the following modifications are applied. First, the period starting in 1970 is shortened by 5 years. Starting in 1975 allows for more observations to enter into consideration. The sample size is raised from 39 to 66 observations of overall reforms, and from 65 to 89 observations of CMR reforms.

Second, while the initial starting point of the reforms is kept at 1975 to use the newly available observations, energy independence is dropped and natural resource rents are used now to predict the timing of reforms in the first stage of the 2SLS estimations. This allows for checking if the results crucially depend on the choice of instruments.

Third, four sets of panel data estimations were conducted for both the GDP and the growth rate of country i in period t. Initially, I use the overall deregulation reform, the trade reform and the property rights reform indices I_{it} directly.

Then, in the remaining three sets of estimations, I construct reform variables in the following way: a) a country is a reformer if $I_{it} > I_{it} - 1$, and a non-reformer otherwise; b) a country is a reformer if $I_{it} > Median(I_i)$, and a non-reformer otherwise; c) a country is a reformer if $I_{it} > Mean(I_i)$, and a non-reformer otherwise. The advantage of all those four methods of constructing a reform variable is that all four avoid relating a country to the entire distribution of reforms within a period. Rather, a country is considered a reformer based on its own path of reforms. In case a), a country is a reformer in a given area if the reform index I in that area was higher than in the previous period. In case b), the median is taken over the entire time span of reforms in a given area for that country. When the country goes over the median of its own reforms, it becomes a reformer. In case c), the median is substituted with the mean of reforms.

Fourth, the PWT is admittedly one of the most comprehensive sources of country level panel data. However, one of the criticisms aimed at the different versions of the PWT dataset is that they lead to a systematic variability of the levels and the growth estimates (Johnson et al., 2012). Therefore, in the final robustness check, I repeat the baseline exercise but use the WDI data instead of the PWT.

Table 3. Deregulation and Average Levels of Real GDP/c: 1975-2010

	Median criterion				Mean criterion			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
ER	0.340***	0.459***			0.346***	0.430***		
	(0.084)	(0.111)			(0.082)	(0.128)		
LR	0.008	0.055			-0.025	-0.153		
	(0.090)	(0.148)			(0.104)	(0.201)		
MR	0.079	0.257**			0.062	0.167		
	(0.063)	(0.117)			(0.061)	(0.119)		
FTER	-0.007	-0.038	-0.030	-0.094	-0.028	-0.023	0.012	-0.053
	(0.079)	(0.136)	(0.080)	(0.162)	(0.072)	(0.128)	(0.082)	(0.155)
FTLR	0.038	0.084	0.086	0.123	0.001	0.084	0.078	0.094
	(0.107)	(0.151)	(0.096)	(0.196)	(0.096)	(0.159)	(0.088)	(0.176)
FTMR	0.047	0.059	0.155	-0.050	0.033	0.191	0.189*	0.009
	(0.122)	(0.162)	(0.107)	(0.176)	(0.110)	(0.225)	(0.102)	(0.194)
RGDPc'75	0.084**	0.091**	0.059*	0.045	0.078**	0.088**	0.039	0.017
	(0.039)	(0.037)	(0.033)	(0.041)	(0.035)	(0.035)	(0.031)	(0.042)
CMER			0.075	0.049			0.073	-0.055
			(0.079)	(0.170)			(0.080)	(0.143)
CMLR			-0.290**	-0.276**			-0.317**	-0.375**
			(0.096)	(0.140)			(0.090)	(0.147)
CMMR			-0.098	-0.171			-0.145	-0.284
			(0.094)	(0.190)			(0.105)	(0.230)
Const.	-0.582	-0.725*	-0.231	-0.046	-0.503	-0.649*	-0.069	0.228
	(0.376)	(0.372)	(0.317)	(0.457)	(0.342)	(0.371)	(0.293)	(0.453)
N	66	66	89	89	66	66	89	89
R^2	0.337	0.291	0.243	0.161	0.364	0.277	0.259	0.171
Hansen J		0.385		0.428		0.512		0.516
APF-ER		4.521		3.312		3.827		7.320
APF-LR		5.319		12.488		12.334		8.601
APF-MR		8.479		9.705		11.629		25.924

Notes: The estimated OLS equation is $\Delta Avg.log(GDP)_{it} = \beta_1 + \beta_2 ER_{it} + \beta_3 LR_{it} + \beta_4 MR_{it} + X_{it}\beta_5 + \Delta\varepsilon_{it}$, where $\Delta Avg.log(GDP)_{it}$ is the difference in the average log-levels of per capita GDP. The variables ER, LR and MR are the Early-, Late-, and Marathon reformers, respectively, as defined in the text. The variables CM-ER, CM-LR and CM-MR are the early-, late-, and marathon reformers in the credit market regulation as defined in the text. The variables FT-ER, FT-LR and FT-MR are the early-, late-, and marathon reformers in the freedom to trade internationally as defined in the text. RGDPc'75 is the log of real GDP per capita in 1975. Robust standard errors are presented in parentheses. Hansen J is the P-value on the Hansen overidentification test. APF- is the value of the Angrist-Pischke first stage F-test on the endogenous variables of interest. Data source: PWT 7.1 data; EFW 2012 index; US EIA data. Symbols: * p < 0.10, ** p < 0.05, *** p < 0.01.

5.1. Shortening the Time Span

The results from repeating the baseline model on a shorter time span more observations are given in Table 3. Table 3 repeats the main message from Table 1. Early

and Marathon reformers differ significantly from the rest of the reformers, and enjoy higher living standards. In addition, the growth acceleration in Table 4 of the ERs and MRs was not significantly higher than the one of the non-reformers, which is still a robust result.

Table 4. Deregulation and Compound Economic Growth: 1975-2010

	Median criterion				Mean criterion			
	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS	(5) OLS	(6) 2SLS	(7) OLS	(8) 2SLS
ER	-1.132	-2.364**			-1.008	-2.000*		
	(0.848)	(1.162)			(0.779)	(1.118)		
LR	-0.275	-0.978			0.293	-0.260		
	(1.060)	(1.422)			(1.093)	(1.063)		
MR	-0.487	-1.494			-0.295	-0.897		
	(0.750)	(1.056)			(0.653)	(0.799)		
FTER	-0.393	0.216	-0.238	0.472	-0.138	0.286	-0.073	1.071
	(0.524)	(1.165)	(0.545)	(1.418)	(0.505)	(1.013)	(0.528)	(1.272)
FTLR	0.403	2.546**	0.293	1.102	0.903	2.930**	0.801	2.383
	(1.158)	(1.274)	(0.792)	(1.432)	(1.179)	(1.330)	(0.847)	(1.690)
FTMR	0.977	2.168	0.469	1.803	1.372	2.325	0.912	2.444*
	(0.841)	(1.549)	(0.762)	(1.340)	(0.898)	(1.557)	(0.821)	(1.371)
RGDPc'75	-0.263	-0.064	0.018	0.271	-0.228	-0.024	0.111	0.489
	(0.246)	(0.253)	(0.269)	(0.335)	(0.270)	(0.256)	(0.279)	(0.343)
CMER			0.073	1.235			0.264	1.597
			(0.592)	(1.201)			(0.552)	(1.111)
CMLR			1.864**	4.053**			1.679*	3.308***
			(0.917)	(1.182)			(0.877)	(1.218)
CMMR			1.218	1.703			1.242	2.141
			(0.753)	(1.624)			(0.861)	(1.882)
Const.	2.852	1.037	-0.513	-4.353	2.112	0.170	-1.490	-6.646*
	(2.246)	(2.551)	(2.625)	(3.466)	(2.466)	(2.744)	(2.690)	(3.664)
N	66	66	89	89	66	66	89	89
R^2	0.129	-0.002	0.146	-0.011	0.157	0.045	0.134	-0.003
Hansen J		0.391		0.586		0.439		0.495
APF-ER		4.521		3.312		3.827		7.320
APF-LR		5.319		12.488		12.334		8.601
APF-MR		8.479		9.705		11.629		25.924

Notes: The estimated OLS equation is $\Delta g_{it} = \beta_1 + \beta_2 ER_{it} + \beta_3 LR_{it} + \beta_4 MR_{it} + X_{it}\beta_5 + \Delta\varepsilon_{it}$, where Δg_{it} is the difference in the compound growth rate between the two periods. The variables ER, LR and MR are the Early-, Late-, and Marathon reformers, respectively, as defined in the text. The variables CM-ER, CM-LR and CM-MR are the early-, late-, and marathon reformers in the credit market regulation as defined in the text. The variables FT-ER, FT-LR and FT-MR are the early-, late-, and marathon reformers in the freedom to trade internationally as defined in the text. RGDPc'75 is the log of real GDP per capita in 1975. Robust standard errors are presented in parentheses. Hansen J is the P-value on the Hansen overidentification test. APF- is the value of the Angrist-Pischke first stage F-test on the endogenous variables of interest. Data source: PWT 7.1 data; EFW 2012 index; US EIA data. Symbols: * p < 0.10, ** p < 0.05, *** p < 0.01.

5.2. Substituting Rents for Energy Independence

Table 5 presents the results from the 2SLS estimates of the baseline equation when rents substitute for the energy independence. The message the table delivers is that, again, ERs and MRs have higher living standards while they do not necessarily grow faster than the LRs and the non-reformers. The results are somewhat stronger in terms of instruments testing as well. While the Hansen test cannot reject the validity of the instruments in most cases, the APF test is higher than 10 in more cases than before.

5.3. Panel Data Estimates

Tables 6 through 13 present the results from panel data versions of the baseline model. In each table, two sets of six estimations were done. The first set of six models corresponds to the overall effect from deregulation, while the second set of models corresponds to the effects from liberalizing credit markets. Within each set of six models, the following estimations were conducted: i) Panel OLS with fixed effects (FEs) and clustered standard errors (SEs); ii) Panel 2SLS with FEs and clustered SEs, where energy independence instrumented for the change in the reform index; iii) difference GMM with robust SEs, where the energy independence and the lag of energy independence were instruments, and the rest of the variables but the year effects were treated as endogenous; iv) system GMM with robust SEs, where the energy independence and the lag of energy independence were instruments, and the rest of the variables but the year effects were treated as endogenous; v) and vi) repeated iii) and iv) but rents substituted for the energy independence.

Table 6 uses the reform indices directly, Table 7 transforms the indices into reform variables by using the country's own path of reforms for each of the reforms studied. Table 8 transforms the indices into reform variables by using the country's own median of reforms over time, while Table 9 uses the country's own mean. When a given reform index passes above its mean, the country is considered a reformer in that particular area. Tables 6 through 9 use the $Log(GDP)_{it}$ as the dependent variable, while Tables 10 through 13 repeat the above work for the compound growth rate g_{it}. To accommodate the data availability in the EFW reform indices, the time interval in each panel data estimations is set at 5 years.

All the panel data estimations point to a recurrent message: both overall and CMR reforms are associated with higher living standards. Unlike the baseline models, however, the panel data estimates add another conclusion: both the overall and the CMR reforms can accelerate growth. This results could be driven by either the more appropriate panel data methods or by a natural trait of growth accelerations: that they are only temporary, as Hausmann et al. (2005) suggest. Thus, it is only natural that a reform could not produce a growth acceleration effect over a 20-year or even a 15-year period, since accelerations happen over shorter episodes. This work adds to their evidence by slicing the data into 5-year periods and concluding that both overall and CMR reforms could produce growth accelerations.

5.4. Using the WDI Data

Instead of the PWT data, the last set of robustness checks uses the WDI data to measure both GDP and growth rates, and repeat the baseline model. As expected, the results from this check do not significantly differ from the baseline results. They are robust both in terms of magnitude and significance. For brevity, the presentation is skipped but is available upon request.

The results from the four broad sets of robustness checks here demonstrate that there is indeed a robust positive relationship between being early and a marathon reformer and the levels of per capita GDP. In addition, reforming credit markets late is associated with lower levels of per capita GDP but with a faster catch up process emanated in a significant growth acceleration effect for the late reformers. The panel data methods and using another major data source on the dependent variable corroborates the baseline findings.

6. CONCLUSION

The effects from deregulation on living standards and on growth vary across economies and across the timing of the deregulation reform. The countries that lagged behind in their deregulation reform in the 1970s and the 1980s but accelerated the reform in the 1990s and early in the new century had lower per capita GDP levels than the early reformers and those countries that reformed extensively in both periods – the "marathon" reformers. This means deregulating early and continuously is also associated with higher living standards. However, when it comes to growth acceleration, there is no significant difference between the various types of overall deregulation reformers. This result suggests that an overall reform does not necessarily cause growth accelerations over long periods of time.

In order to analyze the impact of a more specific reform, I consider the impact of deregulation on the credit markets alone. Although the results are not as strong as before in terms of magnitude, the sign remains indicative of the inherent difference between the early and the late reformers: late credit market deregulation is also associated with being poorer.

There appears to be a large positive and significant effect on both living standards and on growth rates from both the overall and the credit market deregulation. This result surfaced from the robustness checks in which the data was sliced into shorter 5-year time periods, and panel data methods were applied. This result also suggests that there could be large dynamic welfare losses if market-oriented reforms lose momentum in the wake of recessions.

REFERENCES

Acemoglu, D., P. Aghion, and F. Zilibotti (2006), "Distance to Frontier, Selection, and Economic Growth," *Journal of the European Economic Association*, 4(1), 37-74.

Acharya, V.V., R.P. Baghai, and K.V. Subramanian (2013), "Labor Laws and Innovation," *Journal of Law and Economics*, 56(4), 997-1037.

Aghion, P., A. Alesina, and F. Trebbi (2007), "Democracy, Technology, and Growth," NBER Working Paper No. 13180.

Alesina, A., S. Ardagna, G. Nicoletti, and F. Schiantarelli (2005), "Regulation and Investment," *Journal of the European Economic Association*, 3(4), 791-825.

Alexeev, M. and R. Conrad (2009), "The Elusive Curse of Oil," *Review of Economics and Statistics*, 91(3), 586-598.

Autor, D.H., W.R. Kerr and A.D. Kugler (2007), "Does Employment Protection Reduce Productivity? Evidence from US States," *Economic Journal*, 117(521), 189-217.

Barseghyan, L. (2008), "Entry Costs and Cross-country Differences in Productivity and Output," *Journal of Economic Growth*, 13, 145-167.

Bassanini, A., L. Nunziata and D. Venn (2009), "Job Protection Legislation and Productivity Growth in OECD Countries," *Economic Policy*, 24(58), 349-402.

Beck, T. and L. Laeven (2006), "Institution Building and Growth in Transition Economies," *Journal of Economic Growth*, 11, 157-186.

Blanchard, O. and F. Giavazzi (2003), "Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets," *Quarterly Journal of Economics*, 118(3), 879-907.

Botero, J.C., S. Djankov, R. La Porta, F. Lopez-de-Silanes and A. Shleifer (2004), "The Regulation of Labor," *Quarterly Journal of Economics*, 119(4), 1339-1382.

Calomiris, C. (2009), "Banking Crises and the Rules of the Game," NBER Working Paper No. 15403.

Cameron, A.C. and P.K. Trivedi (2005), *Microeconometrics: Methods and Applications*, Cambridge: Cambridge University Press.

Cingano, F., M. Leonardi, J. Messina and G. Pica (2010), "The Effects of Employment Protection Legislation and Financial Market Imperfections on Investment: Evidence from a Firm-level Panel of EU Countries," *Economic Policy*, 25(61), 117-163.

Deakin, S. and P. Sarkar (2008), "Assessing the Long-run Economic Impact of Labour Law Systems: A Theoretical Reappraisal and Analysis of New Time Series Data," *Industrial Relations Journal*, 39(6), 453-487.

Demirgüç-Kunt, A., L. Laeven and R. Levine (2004), "Regulations, Market Structure, Institutions, and the Cost of Financial Intermediation," *Journal of Money, Credit and Banking*, 36(3), 593-622.

Demirgüç-Kunt, A. and R. Levine (2008), "Finance, Financial Sector Policies, and Long-run Growth," World Bank Policy Research Working Paper Series No. 4469.

Estache, A. and L. Wren-Lewis (2009), "Toward a Theory of Regulation for Developing Countries: Following Jean-Jacques Laffont's Lead," *Journal of Economic Literature*,

47(3), 729-770.
Estevadeordal, A. and A.M. Taylor (2013), "Is the Washington Consensus Dead? Growth, Openness, and the Great Liberalization, 1970s-2000s," *Review of Economics and Statistics*, 95(5), 1669-1690.
Freeman, R.B. (2010), "Labor Regulations, Unions, and Social Protection in Developing Countries: Market Distortions or Efficient Institutions?" in Rodrik, D. and M. Rosenzweig. eds., *Handbook of Development Economics Volume 5*, Elsevier.
Gwartney, J., J. Hall and R. Lawson (2012), "2012 Economic Freedom Dataset," Economic Freedom of the World: 2012 Annual Report.
Hanousek, J., D. Hajkova and R. K. Filer (2008), "A Rise by Any Other Name? Sensitivity of Growth Regressions to Data Source," *Journal of Macroeconomics*, 30(3), 1188-1206.
Hausmann, R., L. Pritchett and D. Rodrik (2005), "Growth Accelerations," *Journal of Economic Growth*, 10, 303-329.
Heston, A., R. Summers and B. Aten (2012), "Penn World Table version 7.1," Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania.
Jayaratne, J. and P.E. Strahan (1996), "The Finance-growth Nexus: Evidence from Bank Branch Deregulation," *Quarterly Journal of Economics*, 111(3), 639-670.
Johnson, S., W. Larson, C. Papageorgiou and A. Subramanian (2012), "Is Newer Better? Penn World Table Revisions and Their Impact on Growth Estimates," *Journal of Monetary Economics*, 60(2), 255-274.
Levine, R. (2005), "Law, Endowments and Property Rights," *Journal of Economic Perspectives*, 19(3), 61-88.
_____ (2010), "An Autopsy of the US Financial System: Accident, Suicide, or Negligent Homicide," *Journal of Financial Economic Policy*, 2(3), 196-213.
MacLeod, W.B. and V. Nakavachara (2007), "Can Wrongful Discharge Law Enhance Employment?" *Economic Journal*, 117(521), 218-278.
Matthews, K., P. Minford, S. Nickell and E. Helpman (1987), "Mrs Thatcher's Economic Policies 1979-1987," *Economic Policy*, 2(5), 57-101.
Morgan, I. (2004), "Jimmy Carter, Bill Clinton, and the New Democratic Economics," *Historical Journal*, 47, 1015-1039.
Mulligan, C.B. and K.K. Tsui (2015), "Political Entry, Public Policies, and the Economy," *Research in Economics*, 69(3), 377-397.
Pera, A. (1989), "Deregulation and Privatization in an Economy-wide Context," *OECD Economic Studies*, 12, 159-204.
Rodrik, D. (2008), "Second-best Institutions," *American Economic Review*, 98(2), 100-104.
Stankov, P. (2017) *Policies and Reforms. In: Economic Freedom and Welfare Before and After the Crisis*, Palgrave Macmillan: Cham.
Tarr, D.G. (2010), "The Political, Regulatory, and Market Failures that Caused the US Financial Crisis: What are the Lessons?" *Journal of Financial Economic Policy*, 2(2),

163-186.
Tsui, K.K. (2011), "More Oil, Less Democracy: Evidence from Worldwide Crude Oil Discoveries," *Economic Journal*, 121(551), 89-115.
Winston, C. (1993), "Economic Deregulation: Days of Reckoning for Microeconomists," *Journal of Economic Literature*, 31(3), 1263-1289.
_____ (1998), "U.S. Industry Adjustment to Economic Deregulation," *Journal of Economic Perspectives*, 12(3), 89-110.
Wölfl, A., I. Wanner, T. Kozluk and G. Nicoletti (2009), "Ten Years of Product Market Reform in OECD Countries: Insights from a Revised PMR Indicator," OECD Working Paper No. 695.

Mailing Address: Economics Department, Royal Holloway, University of London, Egham, Surrey, TW20 0EX, The United Kingdom, Email: petar.stankov@rhul.ac.uk.

Received October 18, 2017, Revised December 21, 2018, Accepted December 24, 2018.