Rough Solutions to the Project Exam 2020:
Does Internet Reduce Inflation

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This is just an example of a sample paper. Depending on your choice of variables, on the specification of your regressions (e.g. linear or in logs) etc you might have different results and the interpretations below might not fit your model. You will not be graded against this file, but rather by checking the precision and clarity of your writing, breadth and appropriateness of the methods used and justification of your choices.

1 Introduction

With the end of the so called "Great Inflation" in the early 80s, increases in the Consumer Price Index (CPI) have been steadily getting smaller and smaller. Compared to the wild swings of the rest of the 20th century, this trend represents a dramatic change. This new trend coincides with at least one major technological change: the accessibility of web browsing and internet to businesses and consumers.

It has been argued that internet could provide several deflationary effects. First, the transparency on prices could imply a stronger competitive pressure on the products distributed through e-commerce than for the physical retail trade, and therefore lower margins. Second, by supporting international trade of goods and services, internet could have a positive impact on the globalization trend, which in turn has well established disinflationary effects. Third, the development of the internet could also reduced production costs and increased productivity.

In this paper, I investigate whether internet reduces inflation. In the first part of the paper, a simple linear regression model is estimated via OLS. I find a partial correlation that is consistently negative across several models. In the second part of the paper, the analysis is further extended along two key dimensions. First, I present results that take into account the fact that different countries might have different economic structures that deliver presistently different levels of inflation. Second, I attempt to further reduce concerns of endogeneity with the aid of an instrumental variable. Across these extensions, the results of the baseline model are overturned. Overall, I conclude that the relationship between internet and inflation is at best weak.

The rest of the paper is organized as follows. Section 2 presents the data used in the analysis. Section 3 presents the baseline results. Section 4 presents a set of extensions to

the model and section 5 discusses the findings, presenting a number of limitations. Section 6 concludes.

2   Data

The paper uses a dataset of 19 countries during the period 1995 to 2014.[1] Note that not all variables might be available for all countries and time periods.

Table 1 shows the summary statistics for the estimation sample. Several interesting features emerge. First, inflation in the 1995-2014 period has been low and around 2.4%. This number masks however some heterogeneity across countries: some countries, most notably Japan, has experience deflation, while others such as Iceland has experienced up to 12% increases in CPI during the last financial crisis. Similar heterogeneity is found also in the prevalence of internet. The number of broadband subscriptions as a percentage of the country population range in fact from very low levels, albeit this mostly occurs in the 1995-2000 period, to up to 42% of the total population in Switzerland in 2013. On average across countries and time, 17% of the population is covered by a broadband subscription. What is the overall relationship between these two variables? Figure 1 preliminarly answer this question. We can see that there is an overall negative, albeit small negative relationship between inflation and internet.

In the analysis, several other characteristics will be used. It has been argued that trade openness reduced a country inflation. Hence, the real effective exchange rate and the merchandise trade as percentage of GDP will be included. Additionally, inflation will also be determined by macroeconomic conditions. Hence, the table presents the average output gap and the average unemployment rate. Overall, we see that countries in the sample are open and have produced below their potential, with an average unemployment rate of 7% in the period.

The rest of the paper will discuss how robust the relationship shown in Figure 1 is to the use of different estimators and taking into account other, possibly confounding, factors.

3   Baseline Model

Our baseline model applies the OLS estimator to a general model, which takes the form:

$$cpi_{it} = \beta_0 + \beta_1 internet_{it} + \boldsymbol{x'_{it}}\boldsymbol{\gamma} + v_{it}, \tag{1}$$

where cpi_{it} indicates the inflation rate in country i at time t, $internet_{it}$ indicates the number of subscriptions as percent of the total population and $\boldsymbol{x_{it}}$ is a vector of characteristics that can include openness, the effective exchange rate, the output gap and the unemployment rate.

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[1]The original dataset included 20 countries. However, data for the exchange rate in Estonia were missing. For consistency we dropped this country throughout the analysis. However, including Estonia, without controlling for the exchange rate, does not quantitatively alter the main results presented. See Appendix A .

We apply an OLS estimator to this model, and assume for now that v_{it} is uncorrelated to any of the regressors. [2]

Table 2 shows the baseline results. I start in column (1) by showing the raw correlation already depicted in Figure 1. The results suggest that as the number of internet subscription increases by 1 unit per capita, inflation is expected to decrease by 2.49%. This number might however masks the impact of other variables on inflation. For instance, countries where internet is widespread, might also be more open economies and hence face lower levels of inflation. To control for this channel, column (2) includes a set of variables that control position on the international market: its openness to trade, the exchange rate, and an index of commodity prices. The results suggest that a unit increase in the real effective exchange rate reduces inflation by 0.06%. This result is consistent with macroeconomic models, where a currency appreciation reduces internal demand for goods and therefore the pressure on prices. On the other hand, a 1% increase in merchandise trade over GDP increases inflation by 0.01%; similarly a unit increase in the HWWI index increases inflation by 0.019%. More importantly, the inclusion of these variables strengthen the negative relationship between inflation and internet: the results now suggest that inflation will be reduced by almost 9%, ceteris paribus, for each unit increase in subscriptions per capita.

Finally, column (3) includes macroeconomic variables that are likely to affect inflation. We find that a 1% increase in the output gap increases inflation by 0.16%. On the contrary, we do not find evidence of the so called Phillips curve: there is no statistically significant relationship between unemployment and inflation. Yet, the relationship between internet and inflation persists even after the inclusion of these last two variables.

4   Extensions

The results in Table 2 provide an interesting estimation of a partial correlation between inflation and internet. However, there are several shortcomings to this baseline analysis.

The OLS regressor has ignored the term c_i. This is an unobserved, time-invariant country-specific effect, while u_{it} captures unobserved time-varying effects. Both c_i and u_{it} may be potentially correlated with $internet_{it}$. For example, the sample might be composed of heterogeneous countries more economically important or with a more favorable geography might face a different price structure and also be more likely to invest in the internet. In principle, also u_{it} might include time-varying unobserved components of inflation, such as changes in money supply. Since monetary policy might interact, through investment, with the development of internet, the data might prevent us to control for a number of important and omitted factors. Lastly, the baseline model did not exploit the time dimension of the dataset, ignoring that there might have been global shocks, such as the financial crisis, that could have affected both inflation and internet.

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[2]All our models are however robust to heteroskedasticity. We find in fact with a Breusch-Pagan test evidence for heteroskedasticity at all standard significance levels. We use throughout heteroskedasticity-robust standard errors.

To address these two concerns we complement the analysis in the previous section using two additional strategies.

We start in Table 3 by accounting for c_i and for the presence of global, time-specific shocks. Both are important variables to be taken into account. Not only countries might be substantially heterogenous, but also the global economy has gone through a number of booms and burst during this period. Such wide economic conditions are likely to have been correlated with the development of internet as well as inflation. Interestingly, this strategy completely changes the sign of our relationship and halves its magnitude. We find .....

Next, we present in Table 5 regressions using an instrumental variable technique. As mentioned above, even with the inclusion of country and time dummies, one might still be concerned that there are important other factors that have been omitted. The dataset, for example, has no information on money supply, which, in a 20-year period, can neither assumed to be constant – and hence captured by fixed effects – nor uncorrelated with internet. Besides these concerns of omitted variable bias, it is also possible that the number of internet subscriptions are measured with error. To reduce these concerns, given data availability, I use the number of fixed-phone subscriptions per capita as an instrumental variable for internet subscriptions. Two conditions need to be satisfied. First, the number of fixed-phone subscriptions need to predict the number of internet subscriptions. This condition can be tested, but we could expect a relationship between these two variables as places that are already connected might more easily develop an internet network - or, on the contrary, find no need to do so. Second, we need the number of phone subscription to be unrelated with the error term. As phones have developed early in the century, and much of trade does not occur by phone, it is unlikely that the phone network is related to other relevant and omitted variables such as monetary policy. This assumption is however not testable and I will presume that it holds true.

Table 4 presents the first-stage estimates. Across all models, we find a negative partial correlation between the number of phone subscriptions and the number of broadband subscriptions, per capita. In particular, circa 10 extra subscription per capita is expected to reduce the number of broadband subscriptions by c.a. 1, ceteris paribus. Albeit this relationship is statistically significant at standard levels, the t-test associated to it is below 3.2 (in column (3) it is -2.66). This implies that the instrument does not pass the usual rule of thumb and it is not strong enough. (Expand this further discussing what the concerns are and possible consequences.)

Table 5 presents the results for the second stage. Because the number of phone subscriptions are available only from 2000 onward, I first replicate the results obtained with the fixed effects in the subsample used in the IV estimation. The estimates are reported in column (1). Focusing on the period 2000-2014 does not change the significance and the sign of the relationship. We still find...... With this in mind, in column (2) to (4) we report the second-stage IV estimates. The results remain positive, albeit statistically insignificant. We find that ...... As mentioned, the results are however based on an instrument that is weak. It might nonetheless be reassuring that these results are qualitatively in line with the ones obtained in

Table 3.

(Note that here one can further check robustness of these findings by looking at nonlinearities, subsample analysis)

5   Discussion and Limitations

This analysis started by uncovering a negative, strong, partial correlation between inflation and broadband subscriptions. This results were however overturned once I controlled for country-specific heterogeneity and allowed for time-specific shocks.

There are a number of concerns still present. While the fixed-effect estimates reported in Table 3 point to a more credible partial correlation between inflation and internet, they might still suffer for a number of problems. (Discuss here potential OVB, measurement error and simultaneity - this less likely). The attempt to an IV was unsuccessful as the instrument was not strong enough.

While this is a major shortcoming of the analysis, as endogeneity concerns would cause the fixed effect estimator to be biased and inconsistent, there are also a number of additional checks that one could have performed, time permitting. For example, standard errors were calculated in the main text under the assumption of heteroskedasticity but serially uncorrelated errors. This is unlikely to be a realistic assumption as shocks at the country-level tend to have lasting effects on the economy. One could also worry that some of the results are plagued by a relatively small sample size: 19 countries for 20 years. Finally, there might be data quality issues. For example, Figure 2 shows an unexplainable break in the time series for broadband subscriptions, likely due to a change of definition and casting doubt on the overall quality of the data.

Two conclusions can be drawn. The negative theoretical relationship might not be as strong in the data, given that results vary substantially across estimation techniques. More work should be put in trying to find a suitable instrument.

6   Conclusions

Since the early 1980s, inflation has been lower than at the beginning of the century across the world. While theory argues that one possible explanation for this pattern is the accessibility of internet, this empirical analysis did not find strong evidence for it.

Using both an OLS estimator, a dummy-variable fixed effect strategy, and a dummy-variable fixed effect strategy with a (weak) instrumental variable, we find that the more credible results point to the opposite direction than what expected. In the preferred fixed-effect specification, even after controlling for a battery of trade and economic variable, we find that .....

The analysis could be improved along several dimensions, most notably the concern of remaining endogeneity should be tackled in the future.

The relationship between inflation and internet remains therefore an interesting area where further work is needed.
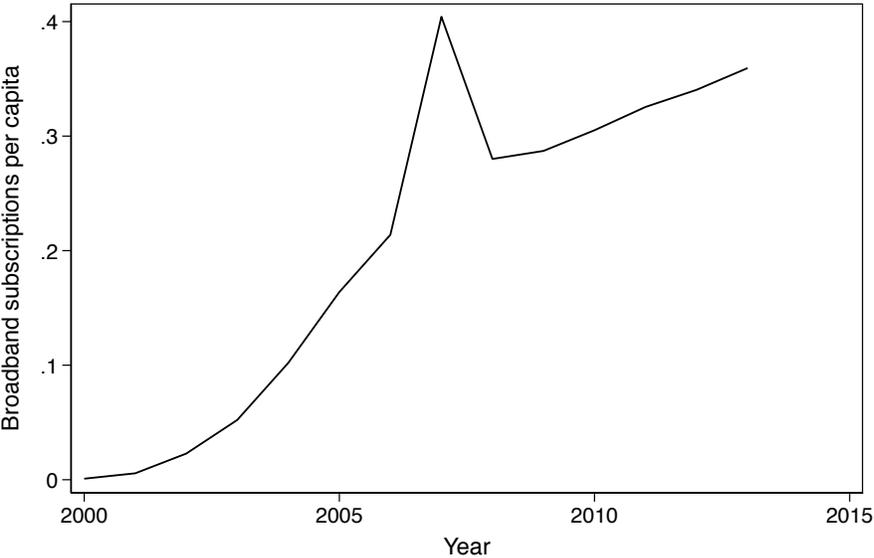
Figures

Figure 1: Scatterplot internet and inflation, full sample
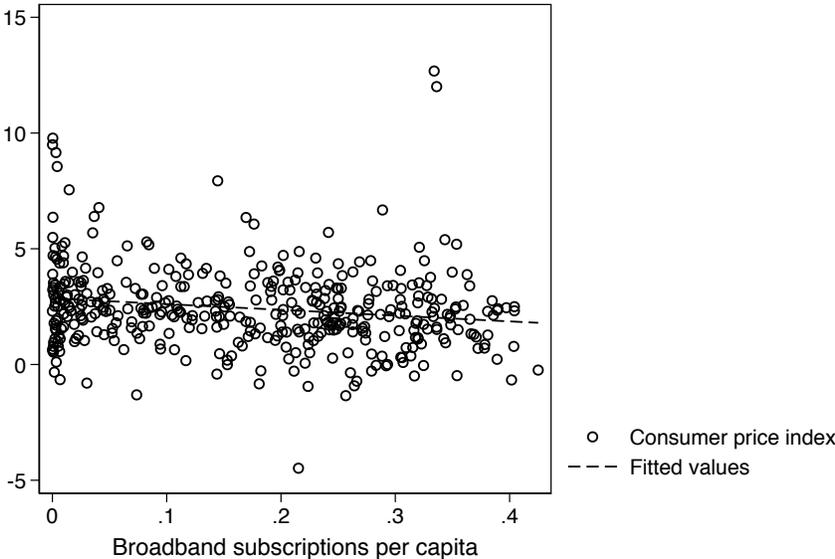
Figure 2: Scatterplot internet and inflation, United Kingdom

Tables

Table 1: Descriptive statistics

	count	mean	sd	min	max
CPI	406	2.434626	1.805303	-4.479938	12.67819
Broadband	406	.1710557	.1224494	.0000291	.4250151
Exchange rate	406	99.46332	10.0585	62.29737	137.1887
Openness	406	67.17242	36.13533	16.41486	180.891
HWWI	406	118.0483	53.92079	36.25427	195.4666
Output gap	406	-.0402196	3.111706	-12.69645	9.003569
Unemployment	406	7.235961	3.900977	1.8	27.2

Data from several sources.
HWWI measures the HWWI Commodity Price Index
Output gap indicates deviations of actual GDP from potential GDP, as a per cent of potential GDP.
Internet measures fixed-broadband subscriptions, as a per cent of total population.
Exchange rate is the real effective exchange rate index (base year 2005).
Openness measures merchandise trade as percent of GD
Unemployment is the unemployment rate
Oil price measures the price of one barrel of oil, in dollar

Table 2: Baseline OLS regression

	(1)	(2)	(3)
Broadband	−2.492***	−8.939***	−8.407***
	(0.792)	(1.100)	(1.186)
Exchange rate		−0.061***	−0.066***
		(0.013)	(0.014)
Openness		0.010***	0.009***
		(0.002)	(0.002)
HWWI		0.019***	0.021***
		(0.002)	(0.002)
Output gap			0.161***
			(0.037)
Unemployment			0.002
			(0.026)
R-Squared	0.03	0.24	0.30
N	406	406	406

Source: see text for explanation.
All variables are explained in Table 1.
Robust standard errors in parenthesis.

Table 3: Country and Time fixed effect regression

	(1)	(2)	(3)
Broadband	4.248*	4.214*	5.158**
	(2.161)	(2.225)	(2.091)
Exchange rate		−0.033***	−0.043***
		(0.011)	(0.011)
Openness		−0.005	−0.011
		(0.009)	(0.009)
HWWI		−0.012**	−0.011**
		(0.006)	(0.005)
Output gap			0.117**
			(0.050)
Unemployment			−0.050
			(0.043)
Time f.e.	Yes	Yes	Yes
Country f.e.	Yes	Yes	Yes
R-Squared	0.62	0.64	0.67
N	406	406	406

Source: see text for explanation.
All variables are explained in Table 1.
Robust standard errors in parenthesis.
All columns include country and year fixed effects.

Table 4: Instrumental variable regression, first stage

	(1)	(2)	(3)
Telephone subscriptions per capita	−0.116**	−0.115**	−0.128***
	(0.047)	(0.047)	(0.048)
Exchange rate		−0.000	0.000
		(0.000)	(0.000)
Openness		−0.000	−0.000
		(0.000)	(0.000)
HWWI		0.002***	0.002***
		(0.000)	(0.000)
Output gap			0.000
			(0.001)
Unemployment			0.002*
			(0.001)
Time f.e.		Yes	Yes	Yes
Country f.e.		Yes	Yes	Yes
R-Squared		0.94	0.94	0.94
N		392	392	392

Source: see text for explanation.
All variables are explained in Table 1.
Robust standard errors in parenthesis.
All columns include country and year fixed effects.

Table 5: Instrumental variable regression, second stage

	Subsample	IV	IV	IV
	(1)	(2)	(3)	(4)
Broadband	5.043**	16.647	16.288	9.077
	(2.140)	(10.481)	(10.235)	(8.401)
Exchange rate	−0.045***		−0.035***	−0.045***
	(0.011)		(0.011)	(0.010)
Openness	−0.012		−0.004	−0.012
	(0.010)		(0.010)	(0.009)
HWWI	−0.017***		0.311***	0.291***
	(0.006)		(0.080)	(0.063)
Output gap	0.125**			0.126***
	(0.051)			(0.047)
Unemployment	−0.047			−0.053
	(0.043)			(0.042)
Time f.e.	Yes	Yes	Yes	Yes
Country f.e.	Yes	Yes	Yes	Yes
R-Squared	0.67	0.57	0.59	0.66
N	392	392	392	392

Source: see text for explanation.
All variables are explained in Table 1.
Robust standard errors in parenthesis.
All columns include country and year fixed effects.
Column (1) uses an OLS estimator on the subsample of countries
for which the instrument is available.

A Appendix: Sample Definition

In the analysis we dropped Estonia, as exchange rate information is unavailable for this country. Table A1 shows that the baseline conclusions are unaffected if this country is included in the sample and the exchange rate is not used as additional control variable.

Table A1: Baseline OLS regression, with Estonia

	(1)	(2)	(3)
Broadband	−2.425***	−8.318***	−7.917***
	(0.787)	(1.306)	(1.376)
Openness		0.009***	0.008***
		(0.002)	(0.002)
HWWI		0.016***	0.017***
		(0.003)	(0.003)
Output gap			0.143***
			(0.038)
Unemployment			−0.014
			(0.027)
R-Squared	0.03	0.14	0.21
N	419	419	419

Source: see text for explanation.
All variables are explained in Table 1.
Robust standard errors in parenthesis.

B Do-file

```
1
2
3    * Summarystat
4    * Because of missing values we create a basic estimation sample
5
6    reg cpi internet gdpgap unemp fx tradeopen hwwi
7    gen esamp = e(sample)
8    preserve
9    keep if esamp == 1
10   eststo clear
11   estpost sum cpi internet fx tradeopen hwwi gdpgap unemp
12   esttab using sumstat_s20.tex, replace cells("count mean sd min max"
     ) noobs nonumber ///
13   varlabels(cpi "CPI" internet "Broadband" gdpgap "Output gap" unemp
     "Unemployment" fx "Exchange rate" tradeopen "Openness" hwwi "HWWI")
      ///
14   title("Descriptive statistics\label{sumstat}") ///
15   addnotes("Data from several sources."  "HWWI measures the HWWI
     Commodity Price Index" "Output gap indicates deviations of actual
     GDP from potential GDP, as a per cent of potential GDP. "
     "Internet measures fixed-broadband subscriptions, as a per cent of
     total population." "Exchange rate is the real effective exchange
     rate index (base year 2005)." "Openness measures merchandise
     trade  as percent of GD" " Unemployment is the unemployment rate"
     "Oil price measures the price of one barrel of oil, in dollar")
16
17
18   set scheme lean1
19   scatter cpi internet || lfit cpi internet
20   graph export "scatter_s20.pdf", as(pdf) replace
21
22   * scatter for UK
23    xtline internet if countryname == "United Kingdom", overlay
24   graph export "scatter_uk_s20.pdf", as(pdf) replace
25
26
27
28   * Some descriptives for the text
29   ta country if cpi<0
30   ta country if cpi>10
31   ta year if countryname == "Iceland" & cpi>12
32   ta country year if internet <0.05
33   ta country year if internet >40, su(internet)
34
35
```

```
35
36   * Pooled OLS
37   * Should we use robust?
38   reg cpi internet fx tradeopen hwwi
39   hettest, iid rhs
40   reg cpi internet fx tradeopen hwwi gdpgap unemp
41   hettest, iid rhs
42
43   eststo: reg cpi internet  , ro
44   est save "b1", replace
45   eststo: reg cpi internet fx tradeopen hwwi  , ro
46   est save "b2", replace
47   eststo: reg cpi internet fx tradeopen hwwi gdpgap unemp  , ro
48   est save "b3", replace
49   eststo: reg cpi internet fx tradeopen hwwi gdpgap unemp  , ro
50   est save "b4", replace
51
52   forvalues i=1(1)4 {
53   est use "b`i'"
54   est store b`i'
55   }
56
57
58   estout  b1 b2 b3  ///
59   using "ols_s20.tex", stats(r2 N, fmt(2 0) labels("R-Squared" "N"))
        ///
60   cells("b(star label( )  fmt(3))" " se(par label( ) fmt(3))") ///
61    varlabels(internet "Broadband" gdpgap "Output gap" unemp
     "Unemployment" fx "Exchange rate" tradeopen "Openness" hwwi "HWWI"
     )  drop(_cons) ///
62   replace mlabels(none) collabels(none) ///
63   starlevels( * 0.1 ** 0.05 *** 0.01) nostardetach   label msign (--)
            ///
64   varwidth(12)  style(tex) ///
65   title(Baseline OLS regression \label{ols}) ///
66   prehead("\begin{table}[!h]\begin{center}" ///
67   "\begin{threeparttable}\topcaption{@title}" ///
68   "\begin{tabular}{@{}l  c c c    } \toprule "  ///
69   "& (1) & (2) & (3)  \\  \cmidrule(r){2-4} " ) ///
70   prefoot("\midrule" ) ///
71   postfoot("\bottomrule\end{tabular}" ///
72   "\begin{tablenotes}"  ///
73   "\item Source: see text for explanation." ///
74   "\item All variables are explained in Table \ref{sumstat}." ///
75   "\item Robust standard errors in parenthesis. " ///
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```
75   "\item Robust standard errors in parenthesis. " ///
76   "\end{tablenotes} \end{threeparttable} \end{center} \end{table}" )
77
78
79   * FE
80   eststo clear
81   eststo: reg cpi internet  i.year i.country, ro
82   est save "b1", replace
83   eststo: reg cpi internet fx tradeopen hwwi  i.year i.country , ro
84   est save "b2", replace
85   eststo: reg cpi internet fx tradeopen hwwi gdpgap unemp i.year i.
     country , ro
86   est save "b3", replace
87   eststo: reg cpi internet fx tradeopen hwwi gdpgap unemp i.year i.
     country , ro
88   est save "b4", replace
89
90   forvalues i=1(1)4 {
91   est use "b`i'"
92   est store b`i'
93   }
94
95
96   estout  b1 b2 b3  ///
97   using "fe_s20.tex", stats(r2 N, fmt(2 0) labels("R-Squared" "N"))
     ///
98   cells("b(star label( )  fmt(3))" " se(par label( ) fmt(3))") ///
99    varlabels(internet "Broadband" gdpgap "Output gap" unemp
     "Unemployment" fx "Exchange rate" tradeopen "Openness" hwwi "HWWI"
     )  keep(internet fx tradeopen hwwi gdpgap unemp )  ///
100  replace mlabels(none) collabels(none) ///
101  starlevels( * 0.1 ** 0.05 *** 0.01) nostardetach   label msign (--)
             ///
102  varwidth(12)  style(tex) ///
103  title(Country and Time fixed effect regression \label{fe}) ///
104  prehead("\begin{table}[!h]\begin{center}" ///
105  "\begin{threeparttable}\topcaption{@title}" ///
106  "\begin{tabular}{@{}l  c c c    } \toprule "  ///
107  "& (1) & (2) & (3)  \\  \cmidrule(r){2-4} " ) ///
108  prefoot("\midrule" ///
109  "Time f.e. & Yes & Yes & Yes \\ " ///
110  "Country f.e. & Yes & Yes & Yes \\\midrule ") ///
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110  "Country f.e. & Yes & Yes & Yes \\\midrule ") ///
111  postfoot("\bottomrule\end{tabular}" ///
112  "\begin{tablenotes}"  ///
113  "\item Source: see text for explanation." ///
114  "\item All variables are explained in Table \ref{sumstat}." ///
115  "\item Robust standard errors in parenthesis. " ///
116  "\item All columns include country and year fixed effects. " ///
117  "\end{tablenotes} \end{threeparttable} \end{center} \end{table}" )
118
119  * IV - first stage
120
121  eststo clear
122  ivregress 2sls cpi (internet=phone) fx tradeopen hwwi gdpgap unemp
     i.year i.country , ro
123  eststo: reg internet phone  i.year i.country if e(sample), ro
124  est save "b1", replace
125  eststo: reg internet phone fx tradeopen hwwi  i.year i.country if e
     (sample), ro
126  est save "b2", replace
127  eststo: reg internet phone fx tradeopen hwwi gdpgap unemp i.year i.
     country if e(sample), ro
128  est save "b3", replace
129
130  forvalues i=1(1)3 {
131  est use "b`i'"
132  est store b`i'
133  }
134
135
136  estout  b1 b2 b3  ///
137  using "iv_first_s20.tex", stats(r2 N, fmt(2 0) labels("R-Squared"
     "N"))  ///
138  cells("b(star label( )  fmt(3))" " se(par label( ) fmt(3))") ///
139   varlabels(internet "Broadband" gdpgap "Output gap" unemp
     "Unemployment" fx "Exchange rate" tradeopen "Openness" hwwi "HWWI"
     )  keep(phone fx tradeopen hwwi gdpgap unemp ) ///
140  replace mlabels(none) collabels(none) ///
141  starlevels( * 0.1 ** 0.05 *** 0.01) nostardetach   label msign (--)
             ///
142  varwidth(12)  style(tex) ///
143  title(Instrumental variable regression, first stage \label{ivfirst
     }) ///
144  prehead("\begin{table}[!h]\begin{center}" ///
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144    prehead("\begin{table}[!h]\begin{center}" ///
145    "\begin{threeparttable}\topcaption{@title}" ///
146    "\begin{tabular}{@{}l  c c c   } \toprule "  ///
147    "& (1) & (2) & (3)  \\ \cmidrule(r){2-4} " ) ///
148    prefoot("\midrule" ///
149    "Time f.e. & Yes & Yes & Yes \\ " ///
150    "Country f.e. & Yes & Yes & Yes \\\midrule ") ///
151    postfoot("\bottomrule\end{tabular}" ///
152    "\begin{tablenotes}"  ///
153    "\item Source: see text for explanation." ///
154    "\item All variables are explained in Table \ref{sumstat}." ///
155    "\item Robust standard errors in parenthesis. " ///
156    "\item All columns include country and year fixed effects. " ///
157    "\end{tablenotes} \end{threeparttable} \end{center} \end{table}" )
158
159
160
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162
163
164    * IV - second stage
165
166    eststo clear
167    ivregress 2sls cpi (internet=phone) fx tradeopen hwwi gdpgap unemp
       i.year i.country , ro
168    eststo: reg cpi internet fx tradeopen hwwi gdpgap unemp i.year i.
       country if e(sample), ro
169    est save "b1", replace
170    eststo: ivregress 2sls cpi (internet=phone)  i.year i.country if e(
       sample), ro
171    est save "b2", replace
172    eststo: ivregress 2sls cpi (internet=phone) fx tradeopen hwwi  i.
       year i.country if e(sample), ro
173    est save "b3", replace
174    eststo: ivregress 2sls cpi (internet=phone) fx tradeopen hwwi
       gdpgap unemp i.year i.country if e(sample), ro
175    est save "b4", replace
176
177    forvalues i=1(1)4 {
178    est use "b`i'"
179    est store b`i'
180    }
181
182
```

```
182
183  estout  b1 b2 b3 b4 ///
184  using "iv_s20.tex", stats(r2 N, fmt(2 0) labels("R-Squared" "N"))
     ///
185  cells("b(star label( )  fmt(3))" " se(par label( ) fmt(3))") ///
186   varlabels(internet "Broadband" gdpgap "Output gap" unemp
     "Unemployment" fx "Exchange rate" tradeopen "Openness" hwwi "HWWI"
     )  keep(internet fx tradeopen hwwi gdpgap unemp )  ///
187  replace mlabels(none) collabels(none) ///
188  starlevels( * 0.1 ** 0.05 *** 0.01) nostardetach   label msign (--)
             ///
189  varwidth(12)  style(tex) ///
190  title(Instrumental variable regression, second stage \label{ivsec})
      ///
191  prehead("\begin{table}[!h]\begin{center}" ///
192  "\begin{threeparttable}\topcaption{@title}" ///
193  "\begin{tabular}{@{}l  c c c c   } \toprule "  ///
194  "& Subsample & IV & IV & IV \\ \cmidrule(r){2-5} " ///
195  "& (1) & (2) & (3)  & (4) \\ \midrule " ) ///
196  prefoot("\midrule" ///
197  "Time f.e. & Yes & Yes & Yes & Yes \\ " ///
198  "Country f.e. & Yes & Yes & Yes & Yes \\\midrule ") ///
199  postfoot("\bottomrule\end{tabular}" ///
200  "\begin{tablenotes}"  ///
201  "\item Source: see text for explanation." ///
202  "\item All variables are explained in Table \ref{sumstat}." ///
203  "\item Robust standard errors in parenthesis. " ///
204  "\item All columns include country and year fixed effects. " ///
205  "\item Column (1) uses an OLS estimator on the subsample of
     countries for which the instrument is available. " ///
206  "\end{tablenotes} \end{threeparttable} \end{center} \end{table}" )
207
208
209
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211
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213
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215
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217
218
```

```
218
219   restore
220
221
222
223
224
225
226
227
228
229
230   * Pooled OLS
231   eststo clear
232   reg cpi internet tradeopen hwwi gdpgap unemp
233   cap drop esamp
234   gen esamp = e(sample)
235   keep if esamp
236   eststo: reg cpi internet  , ro
237   est save "b1", replace
238   eststo: reg cpi internet tradeopen hwwi  , ro
239   est save "b2", replace
240   eststo: reg cpi internet tradeopen hwwi gdpgap unemp  , ro
241   est save "b3", replace
242   eststo: reg cpi internet fx tradeopen hwwi gdpgap unemp oilprice i.
      year, ro
243   est save "b4", replace
244
245
246   forvalues i=1(1)4 {
247   est use "b`i'"
248   est store b`i'
249   }
250
251
252
253   estout  b1 b2 b3  ///
254   using "ols_estonia_s20.tex", stats(r2 N, fmt(2 0) labels(
      "R-Squared" "N"))  ///
255   cells("b(star label( )  fmt(3))" " se(par label( ) fmt(3))") ///
256    varlabels(internet "Broadband" gdpgap "Output gap" unemp
      "Unemployment" fx "Exchange rate" tradeopen "Openness" hwwi "HWWI"
      )  drop(_cons) ///
257   replace mlabels(none) collabels(none) ///
258   starlevels( * 0.1 ** 0.05 *** 0.01) nostardetach   label msign (--)
              ///
```